PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: BAYER -3 PCT

SERIAL NO.: 10/049,173 EXAMINER: ROGER PANG

FILED: FEBRUARY 8, 2002 GROUP: 3681

TITLE: PLANETARY TRANSMISSION

COVER LETTER ENCLOSING BRIEF ON APPEAL

MAIL STOP AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed herewith for filing is a Brief on Appeal, along with the required Appeal Brief Fee for a Large Entity. Thus, enclosed is a check in the amount of $500.00 for the Appeal Brief Fee.

The Commissioner of Patents and Trademarks is hereby authorized to charge any additionally required fee, or to credit any overpayment, to our Deposit Account No. 03-2468.

Respectfully submitted,
Thomas BAYER

Edward Freedman

COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576
(516) 365-9802

Allison C.Collard,Reg No.22,532
Edward R.Freedman,Reg.No.26,048
Attorneys for Applicant

Enclosures: 1. Check for $500.00 for Appeal Brief Fee

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 25 , 2005.

Maria Guastella

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

U.S.P.T.O. Rule 41.37(c)(1) states in part that:

(c) (1) The brief shall contain the following items under appropriate headings and in the order indicated in paragraphs (c)(1)(i) through (c)(1)(x) of this section.

(c) (1) (i) **REAL PARTY IN INTEREST**

The real party in interest in this patent application is the party listed in the above caption.

(c) (1)(ii) **RELATED APPEALS AND INTERFERENCES**

There are no other prior and pending appeals, interferences or judicial proceedings known to appellant, the appellant's legal representative,

or assignee which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(c) (1)(iii) **STATUS OF CLAIMS**

Claims 1-7 have been cancelled. Claims 8 and 9 are currently pending. Claims 8 and 9 are those claims being appealed.

(c) (1) (iv) **STATUS OF AMENDMENTS**

A statement of the status of any amendment filed subsequent to final rejection is as follows. In the Advisory Action dated March 14, 2005, the Patent Examiner stated that the Amendment in Response to Final Office Action filed March 2, 2005, had been entered.

(c) (1) (v) **SUMMARY OF CLAIMED SUBJECT MATTER**

A concise explanation of the subject matter defined in each of the independent claims involved in the appeal, is as follows.

The present invention relates to solving the problem of being able to achieve a significantly greater transmission ratio and torque transfer in a planetary transmission without significantly enlarging the overall volume of the device. In

addition, the stiffness of the transmission is to be elevated significantly. Furthermore, the transmission is to be economically producible with simple means and is to ensure low-wear operation and transmission with little play. (Specification, Page 1 lines 5 to 12).

The first embodiment of the invention is set forth in claim 8 and shown in FIG. 1, wherein a three stage, speed-reducing planetary transmission having, in each stage, a driven sun wheel rolling in an internal gear and interacting with a planet wheel mounted on a planet carrier, in which the sun wheels 9 and 10 of the second stage II and the third stage III respectively are each driven by the planet carrier of the preceding stage, and

a fixed transmission housing 1, in which at least the internal gear 12 of the third stage III is rigidly connected with the transmission housing 1 and the internal gears 6 and 13 of the first stage I and the second stage II respectively are each rigidly connected with the planet carrier 5 of the third stage III, and

in which, furthermore, the planet carriers 8 and 5 of the second stage II and third stage III respectively are each provided with four planet wheels 7 and 11 respectively in a

circumferential direction, and wherein

- the internal gears (6, 12, 13) each have a number of teeth z = 108 in all three stages,

- the transmission ratios are i = 4 for the second stage II and i = 5.5 for the third stage III.

(See page 2 lines 15 to 27 and page 3 lines 1 to 18 of Specification).

The second embodiment of the invention is set forth in claim 9 and shown in FIG. 2 wherein a three stage, speed-reducing planetary transmission having, in each stage, a driven sun wheel rolling in an internal gear and interacting with a planet wheel mounted on a planet carrier, in which the sun wheels 9 and 10 of the second stage II and the third stage III respectively, are each driven by the planet carrier of the preceding stage, and

a fixed transmission housing 1, in which at least the internal gear 12 of the third stage III is rigidly connected with the transmission housing 1 and the internal gears 6 and 13 of the first stage I and the second stage II respectively, are each rigidly connected with the transmission housing 1, and

in which, furthermore, the planet carriers 8 and 5 of the second stage II and third stage III respectively, are each provided with four planet wheels 7 and 11 respectively, in a circumferential direction, and wherein

- the internal gears (6, 12, 13) each have a number of teeth z = 108 in all three stages,

- the transmission ratios are i = 4 for the second stage II and i = 5.5 for the third stage III.

(See page 2 lines 15 to 27 and page 3 lines 1 to 18 of Specification and see page 6 lines 4 to 7 of Specification).

By using four planet wheels across the width in individual transmission stages, on the one hand, high torques can be transmitted in these transmission stages, and, on the other hand, the stiffness of the transmission is significantly elevated. (Specification, Page 1 lines 17 to 21).

Unexpectedly favorable transmission ratios resulted according to the invention when the transmission stages were each designed with four planet wheels in a planet carrier having a transmission ratio of i=5.5, particularly when the internal gear had 108 teeth. Total transmission ratios which were even could be achieved, particularly if an odd transmission ratio i=5.5 was used. (Emphasis Added). (Specification, Page 1 lines 22 to 28).

In a transmission according to the invention which has the approximately the same volume as that known from *EP 0 824 640 B1*, but is slightly larger, an increase of more than 50% in the torque to be transmitted can be achieved. In the same way, an increase of approximately 50% in stiffness is also possible. These increases result, besides from the additional transmission stage, particularly from a use of four planet wheels in each of the two driven stages II, III, and from the selection of a transmission ratio of i = 5.5 in the transmission stage III, each of which is equipped with four planet wheels. (Specification, Page 3 last two lines to Page 4 lines 1 to 9).

For an internal gear with z = 108 teeth, surprisingly, with a predetermined transmission ratio of i = 5.5, four planet wheels can be used in an associated planet carrier, distributed across its width. In spite of this odd single stage transmission ratio, an even overall transmission can be achieved through kinematics according to the present invention (Emphasis Added). (Specification, Page 5 lines 7 to 12).

Only a slight, extremely damped noise emission issues outside the transmission housing from the rapidly running and therefore noise-intensive first two transmission stages. This is

because the rotating parts of the first two transmission stages are not connected directly with the fixed transmission, and therefore, structure-borne noise issuing from them is only relayed over long paths with parting lines, which practically corresponds to a noise enclosure. (Specification, Page 5 lines 19 to 27).

The particular structural features of the invention can best be derived from the Declaration issued by the inventors and filed in the application. In this Declaration, the diagrams are important, and reference is made to them there, in detail.

Fundamentally, in the case of a multi-stage planetary gear mechanism, whole-number translation ratios are desired in total, which means between the input and the output.

For design reasons, only certain whole-number translation ratios can be achieved with gear mechanism stages that have three or four planetary gear wheels in a stage.

Furthermore, the number of possible translation ratios depends on the number of teeth of the internal gear wheels of a gear mechanism stage in which the three or four planetary gear

wheels run. In this connection, it was found that most of the practicable translation possibilities exist in the case of a number of teeth of z = 108.

The greatest possible torque is supposed to be achieved on the output side with a planetary gear mechanism that translates from high to low numbers of rotation.

In order to achieve this technical objective, the Applicant first determined that a maximum torque can be achieved in a gear mechanism stage having three or four planetary gear wheels, with a translation ratio of i = 5.5. This is shown in Diagram 4 with the explanation for a gear mechanism stage having three planetary gear wheels. Diagram 5 shows that in the case of such a translation ratio of i = 5.5, it is possible to achieve a maximum torque in a gear mechanism stage having four planetary wheels. This torque is significantly greater than that which can be achieved with a gear mechanism stage having three planetary gear wheels.

Since a whole-number translation ratio is always desired in the case of a single-stage or multi-stage gear mechanism, and is required in practice, the Applicant's claimed translation ratio

of i = 5.5 never existed in the prior art. This is because a person skilled in the art had to assume, before the time of the present invention, that even in the case of a multi-stage gear mechanism, a non-whole-number translation ratio is always present if a non-whole-number translation ratio exists in one of the gear mechanism stages. Therefore, any gear mechanism stage having a non-whole-number translation ratio was eliminated from consideration by persons skilled in the art.

Then, in order to achieve the inventive concept, the Applicant discovered how to build a three-stage gear mechanism, for example, in which one gear mechanism stage has a non-whole-number translation ratio. It was then discovered nevertheless, despite this that, a whole-number translation ratio can be obtained in the final product.

The explanation for this is provided by Diagram 3, from which it is evident that in the case of a gear mechanism in which one gear mechanism stage is designed with i = 4 and another gear mechanism stage is designed with i = 5.5, it is possible to achieve a whole-number i = 22 in the final product. In addition, there is the further discovery that this whole-number i = 22 is the highest that can be achieved, in the case of the various

possibilities shown in Diagram 3.

The invention then practically results from this, since it essentially consists in designing two consecutive gear mechanism stages, specifically, in the case of a three-stage gear mechanism, in the design of the last two gear mechanism stages. This design is in such a manner that the maximum translation of i = 22 can be achieved, on the one hand, and that the maximum torque can be achieved, on the other hand, by means of an i = 5.5 in the last gear mechanism stage. In this inventive structure, it is, of course, important and a fundamental prerequisite that a whole-number translation ratio be achieved, on the whole, between the input and the output of the gear mechanism.

(c) (1) (vi) **GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

A concise statement of each ground of rejection presented for review is as follows.

In the Final Office Action, the Patent Examiner has rejected Claim 8 under 35 USC 103(a) as being unpatentable over *Shirokoshi (DE 198 40 968 A1)*.

The Patent Examiner has also rejected Claim 9 under 35 USC 103(a) as being unpatentable over *Ridgely (U.S. Patent No. 2,591,967)*.

(c) (1) (vii) **ARGUMENT**

The Patent Examiner has rejected Claim 9 under 35 USC 103(a) as being unpatentable over *Ridgely (U.S. Patent No. 2,591,967)*.

On Page 3 of the Final Office Action, the Patent Examiner admits that *Ridgely* does not specifically teach the number of teeth to be 108 or the ratios of the second stage and third stage being 4 and 5.5, respectively. The Patent Examiner alleges that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify *Ridgely* to employ specific number of teeth and specific ratios, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose, 105 USPQ 237 (CCPA 1955)*.

On Page 3 of the Final Office Action, the Patent Examiner has rejected Claim 8 under 35 USC 103(a) as being unpatentable over *Shirokoshi (DE 198 40 968 A1)*.

On Page 4 of the Final Office Action, the Patent Examiner admits that *Shirokoshi* does not specifically teach the number of teeth to be 108 or the ratios of the second stage and third stage

being 4 and 5.5, respectively. The Patent Examiner alleges that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify *Shirokoshi* to employ specific number of teeth and specific ratios, since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. *In re Rose, 105 USPQ 237 (CCPA 1955)*.

On Page 5 of the Final Office Action, the Patent Examiner has stated that Applicant, after experimentation, has figured out gear ratios that produce good results. Applicant claims this is the optimum range. However, discovering an optimum range from a previously taught invention through experimentation is obvious to one of ordinary skill in the art (see *In re Aller, 105 USPQ 233*).

The Applicant is also filing a copy of the Rule 132 Declaration, as part of the Evidence Appendix. This Declaration Under Rule 132 by the inventor provides a clear and convincing showing that the inventor was able to achieve an unexpectedly and surprisingly beneficial result. It is respectfully submitted that the Patent Examiner is incorrect because the inventor discovered that it is possible to utilize non-even-number translation ratios. This represents the solution to a prior art

problem that was never even recognized by the prior art.

Thus, it is respectfully submitted that the Patent Examiner's conclusion is in error. This is because changing the claimed ratio is much more than a mere change in the size of the structure and is much more than determining possible gear ratios that are merely an optimum range.

It is believed that neither case, *In re Rose* or *In re Aller,* is relevant to the claimed invention. Also, it is believed that neither reference renders obvious the present invention.

The present invention relates to solving the problem of being able to achieve a significantly greater transmission ratio and torque transfer in a planetary transmission without significantly enlarging the overall volume of the device. In addition, the stiffness of the transmission is to be elevated significantly. Furthermore, the transmission is to be economically producible with simple means and is to ensure low-wear operation and transmission with little play.

By using four planet wheels across the width in individual transmission stages, on the one hand, high torques can be transmitted in these transmission stages, and, on the other hand,

the stiffness of the transmission is significantly elevated.

Unexpectedly favorable transmission ratios resulted according to the invention when the transmission stages were each designed with four planet wheels in a planet carrier having a transmission ratio of i=5.5, particularly when the internal gear had 108 teeth. Total transmission ratios which were even could be achieved, particularly if an odd transmission ratio i=5.5 was used. (Emphasis Added).

With a transmission of the invention, a transmission ratio of i=181, for example, can be achieved if the internal gears in which the planet wheels engage each have 108 teeth, the transmission ratios in the individual stages are $i_1 = 10$, $i_2 = 4$, and $i_3 = 5.5$, and in the last transmission stage, i.e. the third i this case (III), there are four planet wheels installed across its width, with four planet wheels in the second transmission stage.

This structure is not taught by either *Ridgely* or *Shirokoshi*.

In a transmission according to the invention which has the approximately the same volume as that known from *EP 0 824 640 B1*,

but is slightly larger, an increase of more than 50% in the torque to be transmitted can be achieved. In the same way, an increase of approximately 50% in stiffness is also possible. These increases result, besides from the additional transmission stage, particularly from a use of four planet wheels in each of the two driven stages II, III, and from the selection of a transmission ratio of i = 5.5 in the transmission stage III, each of which is equipped with four planet wheels.

For transmission of higher moments, a three-stage transmission according to the invention can be advantageously designed as follows.

- All internal gears have a number of teeth z = 108.
- In the third transmission stage, four planet wheels are provided in the planet carrier distributed across its width and $i_3$ = 5.5 is set as the transmission ratio.
- In the second transmission stage, four planet wheels are provided in the planet carrier distributed over its width and $i_2$ = 4 is set as the transmission ratio for this stage.

This structure is not taught by either *Ridgely* or *Shirokoshi*.

For an internal gear with z = 108 teeth, surprisingly, with a predetermined transmission ratio of i = 5.5, four planet wheels can be used in an associated planet carrier, distributed across its width. In spite of this odd single stage transmission ratio, an even overall transmission can be achieved through kinematics according to the present invention (Emphasis Added).

A particular advantage is that, through the transmission kinematics according to the present invention and possible individual or overall transmission ratios, in a three-stage transmission, for example, uniform reliability of the gearings can be achieved, which allows, in turn, high transmittable moments with, at the same time, low wear.

Only a slight, extremely damped noise emission issues outside the transmission housing from the rapidly running and therefore noise-intensive first two transmission stages. This is because the rotating parts of the first two transmission stages are not connected directly with the fixed transmission, and therefore, structure-borne noise issuing from them is only relayed over long paths with parting lines, which practically corresponds to a noise enclosure.

The case cited by the Patent Examiner, *In re Rose, 105*

*USPQ237 (CCPA 1955)* is that the appealed claims relate to a lumber package which is composed of individually banded bundles of lumber which vary in length. These claims were held to be obvious over prior art which taught similar lumber packages of different sizes. The claimed lumber package did not provide any unexpected results.

As discussed above, the claimed three stage, speed-reducing planetary transmission is of a totally different structure.

The present invention solves the problem of being able to achieve a significantly greater transmission ratio and torque transfer in this type of transmission without significantly enlarging the overall volume. In addition, the stiffness of the transmission is to be elevated significantly.

Unexpectedly favorable transmission ratios resulted when the transmission stages were each designed with four planet wheels in a planet carrier having a transmission ratio of i = 5.5, particularly when the internal gear had 108 teeth. Total transmission ratios which were <u>even</u> could be achieved, particularly if an <u>odd</u> transmission ratio i = 5.5 was used.

Thus, contrary to *In re Rose*, the claimed transmission

utilizes the claimed combination of a total even transmission ratio based upon an odd transmission ratio i = 5.5. Nowhere in the prior art of record is this concept taught, suggested or disclosed.

*In re Aller, 105 USPQ 233,* was cited by the Examiner to support the argument that optimum ranges are not a patentable difference. However, the cited prior art does not teach the number of gear teeth claimed and does not teach the ratio of the second stage to be 4 and does not teach the ratio of the third stage to be 5.5. The claimed odd number ratio of 5.5 is uniquely different. Because there is no teaching of any such ratio at all in the prior art, there can be no optimization thereof. Thus, the case *In re Aller* is not relevant to the claimed invention.

Much more relevant cases will now be discussed by the Applicant.

*Ex parte Murphy and Burford, 217 USPQ 479 (BdPatApp&Int 1982)*

"[1] Assuming, arguendo, that this *Goldberg N.Z.* patent otherwise meets claim 1, the patent does not anticipate the claim under any paragraph of 35 U.S.C. 102. Since all limitations of a claim must be considered in determining the claimed subject

matter as is referred to in 35 U.S.C. 103 and it is error to ignore specific limitations distinguishing over the reference,(Emphasis Added), *In re Boe, 505 F.2d 1297, 184 USPQ 38 (CCPA 1974)*, it is necessary that the modification of a prior art device to meet the claim be obvious from teachings in secondary references when taken in conjunction with the level of skill of those having ordinary skill in this art, before a proper basis is established to demonstrate obviousness of the claimed subject matter. *Graham v. John Deere, 383 U.S. 1,86 S.Ct. 684, 825 OG 24, 148 USPQ 459 (S.Ct. 1966)* states:

"Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."

The Patent Examiner has ignored the claimed limitations of Z = 108 gear teeth, of i = 4 for the second stage, and of i = 5.5

for the third stage. Also, there is no secondary reference teaching these claimed features. Thus, claims 8 and 9 are patentable over the prior art.

The next case is *In re Hedges, et al., 228 USPQ 685 (CA FC 1986)*.

"[1] Hedges argues that he sulfonates liquid diphenyl sulfone at high temperature without the expected charring or reduced yields, and that "the totality of the prior art disclosures leads substantially away from the claimed invention". We agree with *Hedges* that the prior art as a whole must be considered. The teachings are to be viewed as they would have been viewed by one or ordinary skill. *Kimberly-Clark v. Johnson & Johnson, 745 F.2d 1437, 1454, 223 USPQ 603, 614 (Fed. Cir. 1984); In re Mercier, 515 F.2d 1161, 1165, 185 USPQ 774, 778 (CCPA 1975)*. "It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art". *In re Wesslau, 353 F.2d at 241, 147 USPQ at 393. Hedges* correctly points out that the references all suggest that lower temperatures of reaction are preferable. No reference suggests

that diphenyl sulfone may advantageously be reacted in the molten state with sulfur trioxide. The data provided by *Hedges* show significant advantages of the claimed invention; these data are not challenged by the PTO."

"On balance, *Hedges* proceeded contrary to the accepted wisdom. (Emphasis Added). This is "strong evidence of unobviousness". *W.L. Gore & Assoc., Inc. V. Garlock, Inc., 721 F.2d 1540, 1552, 220 USPQ 303, 312 (Fed. Cir. 1983), cert. denied, 105 S. Ct. 172 (1984),* citing *United States v. Adams, 383 U.S. 39, 148 USPQ 479 (1966).*"

In the present invention, the claimed odd number transmission ratio of i = 5.5 is contrary to the accepted wisdom. Thus, the claims are patentable, because this is "strong evidence of unobviousness."

The next case is *In re Wright, U.S. Court of Appeals Federal Circuit 6 USPQ2d 1959, (1988).*

"[1] The problem upon which *Wright* was working was improving the pitch-measuring capability of the level, not the visibility of the bubble. The PTO, having conceded that *Wright's* structure

was unobvious for his intended purpose, erred in holding that this was not relevant. The problem solved by the invention is always relevant. The entirety of a claimed invention, including the combination viewed as a whole, the elements thereof, and the properties and purpose of the invention, must be considered.

Factors including unexpected results, new features, solution of a different problem, novel properties, are all considerations in the determination of obviousness in terms of 35 U.S.C. § 103. When such factors are described in the Specification they are weighed in determining, in the first instance, whether the prior art presents a prima facie case of obviousness. *See, e.g., In re Margolis, 785 F.2d 1029, 1031, 228 USPQ 940, 942 (Fed. Cir. 1986)* (comparative data in the Specification must be considered in PTO determination of unexpected results, as part of "the entire body of evidence...which must be weighed in the first instance by the PTO.") When such factors are brought out in prosecution before the PTO, they are considered in determining whether a prima facie case, if made based on the prior art, has been rebutted. *See, e.g., In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 789 (Fed. Cir. 1984)* (rebuttal evidence is considered along with all other evidence of record). In either case, the requisite view of the whole invention mandates consideration of not only its structure but also its properties and the problem solved.

Applicant *Wright* agrees that he has combined old elements. The Commissioner agrees that *Wright* has achieved a new combination, and that the result obtained thereby is not suggested in the references. The patentability of such combinations is of ancient authority. *See, e.g., Prouty v. Draper, 41 U.S. (16 Pet.) 336, 341 (1842); Eames v. Godfrey, 68 U.S. (1 Wall.) 78, 79-80 (1863); Gill v. Wells, 89 U.S. (22 Wall.) 1, 25 (1874); see also H.T. Markey, Why Note the Statute?, 65 J. Pat. Off. Soc'y 331, 333-34 (1983)* ("virtually all inventions are 'combinations', and ...*every* invention is formed of 'old elements'...Only God works from nothing. Man must work with old elements").

In regard to the present invention, the PTO position that the claimed transmission is prima facie obvious is not supported by the cited references. No reference shows or suggests the claimed features that Z=108 internal gear teeth, and that $i_2 = 4$ and $i_3 = 5.5$, or suggests the claimed combination as a solution to the problem of how to achieve a significantly greater transmission ratio and torque transfer in this type of transmission without significantly enlarging the overall volume. In addition, the stiffness of the transmission is to be elevated significantly. Therefore, based upon *In re Wright*, the claimed invention is patentable over the prior art.

In conclusion, the present invention, and all the claims, are believed to be patentable under 35 U.S.C. 103 over all the prior art applied by the Patent Examiner. A prompt notification of allowability is respectfully requested.

Respectfully submitted,
Thomas BAYER

COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576
(516) 365-9802

Allison C.Collard, Reg No.22,532
Edward R.Freedman, Reg.No.26,048
Attorneys for Applicant

Enclosures: 1. Claims Appendix
2. Evidence Appendix

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 25 , 2005.

Maria Guastella

(c) (1) (viii) **CLAIMS APPENDIX**

Claims involved in this Appeal are as follows:

Claim 8.

Three stage, speed-reducing planetary transmission having, in each stage, a driven sun wheel rolling in an internal gear and interacting with a planet wheel mounted on a planet carrier, in which the sun wheels of the second and third stages are each driven by the planet carrier of the preceding stage, and

a fixed transmission housing, in which at least the internal gear of the third stage is rigidly connected with the transmission housing and the internal gears of the first and second stages are each rigidly connected with the planet carrier of the third stage, and

in which, furthermore, the planet carriers of the second and third stages are each provided with four planet wheels in a circumferential direction, and wherein

- the internal gears (6, 12, 13) each have a number of teeth z = 108 in all three stages,

- the transmission ratios are i = 4 for the second

stage and i = 5.5 for the third stage.

Claim 9.

Three stage, speed-reducing planetary transmission having, in each stage, a driven sun wheel rolling in an internal gear and interacting with a planet wheel mounted on a planet carrier, in which the sun wheels of the second and third stages are each driven by the planet carrier of the preceding stage, and

a fixed transmission housing, in which at least the internal gear of the third stage is rigidly connected with the transmission housing and the internal gears of the first and second stages are each rigidly connected with the transmission housing, and

in which, furthermore, the planet carriers of the second and third stages are each provided with four planet wheels in a circumferential direction, and wherein

- the internal gears (6, 12, 13) each have a number of teeth z = 108 in all three stages,

- the transmission ratios are i = 4 for the second stage and i = 5.5 for the third stage.

## (c) (1) (ix) **EVIDENCE APPENDIX**

This Appendix contains a copy of a Declaration Under Rule 132 which was entered by the Patent Examiner and is relied upon by the Appellant in the Appeal. This Declaration Under Rule 132 was entered into the record as an attachment to the Amendment in Response to Final Office Action filed March 2, 2005. The Advisory Action mailed March 14, 2005, indicated that these documents were entered.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: BAYER -3 PCT

SERIAL NO.: 10/049,173 EXAMINER: ROGER PANG

FILED: FEBRUARY 8, 2002 GROUP: 3681

TITLE: PLANETARY TRANSMISSION

DECLARATION UNDER RULE 132

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I, THOMAS BAYER, declare as follows:

that I am the sole inventor of the invention described and claimed in U.S. Patent Application Serial No. 10/049,173, filed February 8, 2002 for the invention titled "PLANETARY TRANSMISSION";

that I have the following academic and employment credentials:

I studied mechanical engineering at a German, recognized, excellent technical university, and graduated as a Dipl.-Ing. (FH) [Graduate in Engineering from this technical university, equivalent to M.S. in Engineering]; that eleven years ago, I became Head of Design at the company Alpha Getriebebau GmbH; that Alpha Getriebebau GmbH is a manufacturer of planetary gear drives, in particular, specifically mainly precision drives, and

is known worldwide; that since one year ago, I have been Director of Research and Strategic Development of this company; that since six years ago, I have been a member of the Scientific Advisory Board of the Germany Research Association for Drive Technology; that this research association has a good reputation among persons skilled in the art and is recognized worldwide; that in particular, I am considered to be an expert on planetary gear drives, among persons skilled in the art in Germany and European countries that border on Germany; that because of the worldwide activities of Alpha Getriebebau GmbH, I am also very familiar with planetary gear drives on all world markets, particularly Japan and the United States;

that I have read and understood the Nonfinal Office Action dated April 2, 2004, which was received in the above-identified Patent Application;

that I have read and understand the two prior art references, which are the *Ridgely U.S. Patent No. 2,591,967*, and the *Shirokoshi DE 198 40 968* which were applied by the Patent Examiner in this Nonfinal Office Action;

that according to the current claims 8 and 9, the invention, briefly summarized, relates to a

3-stage planetary gear mechanism having a tooth number of all the internal geared wheels of 108 and the following particular features in the 2nd and 3rd stage

2nd stage: 4 planets

i= 4

3rd stage: 4 planets

i = 5.5

with i = translation ratio in one stage

That in the background of the invention and in the case of planetary gear mechanisms, there are generally valid design guidelines with reference to the following parameters. These parameters include the tooth number of an internal geared wheel, the number of planets in a gear stage, and the number of possible whole-number translations that can be achieved in a gear stage. These generally known design guidelines are shown in Diagram No. 1. From this, it is clearly evident that in the case of a tooth number of 108 in the internal geared wheel of a gear stage, and three planets, for example, the greatest number of different possible whole-number (integral number) translations, namely 5, can be achieved. The number of possible whole-number translations means that according to the diagram, at an internal geared wheel tooth number of 108 and three planets, a maximum of five whole-number translations can be achieved. This knowledge

is part of the general state of the art. This leads to the result that in practice, internal geared wheels with the tooth number 108 are preferably used. This is done in order to thereby achieve a great variability of possible whole-number translations that can be achieved. In the case of an internal geared wheel tooth number of Z = 108 and 4 planets, there is merely a single whole-number translation, according to the information in this Diagram No. 1.

That in Diagram No. 2, the number of whole-number translations is plotted on the abscissa, and the number of planets that can be used in a gear stage is plotted on the ordinate. Corresponding to Diagram No. 1, a total of five whole-number translations is possible in the case of three planets in a gear stage, specifically with i = 3, 4, 5, 7, and 10. This gain applies with reference to an internal geared wheel having 108 teeth. In the case of four planets in a gear stage, only a whole-number translation ratio with i = 4 is possible. In this regard, the content of Diagram No. 2 is also part of the generally known state of the art.

A person skilled in the art of gear mechanisms understands the state of the art on this basis. In practice, fundamentally, whole-number translation ratios between the input and the output

are generally desired in gear mechanisms. Thus, a person skilled in the art will generally utilize only whole-number translation ratios in the individual gear stages, exclusively, in each instance. Because to do otherwise, the demand for a whole-number translation ratio number that can be achieved by the gear mechanism overall cannot be met.

The present invention proceeds from this general state of the art as described above. In other words, the present invention describes an improvement upon the technical knowledge of a gear mechanism designer.

In an effort to obtain the greatest possible torque at also the greatest possible translation ratio, with the smallest possible planetary gear mechanism and the fewest possible gear stages, the inventor investigated the following. It was investigated whether it might be possible to also achieve non-whole-number translation ratios in a gear stage having three or four planets, under the conditions illustrated in Diagram No. 2. In this regard, the inventor found that in the case of a gear mechanism having three planet gears in a stage, other than the previously known five whole-number translation ratios known before the present invention, it was only possible to implement a single other non-whole-number translation ratio with i = 5.5,

which can be implemented in terms of structure.

In the case of a gear stage having four planet gears, the inventor determined two additional non-whole-number translation ratios as being possible to achieve by his analysis, specifically the translation ratios i = 3.25 and i = 5.5.

Completely in contrast to the technical knowledge of a gear mechanism designer of ordinary skill in the art that is usually practiced, the inventor conceived of the present invention. This was accomplished through an investigation of whether the use of a non-whole-number translation ratio of 5.5, for example, in a gear stage having 3 or 4 planet gears, with a planetary gear mechanism having a total of three stages, would make it possible to achieve unexpected results. An unexpected improvement was made as compared with the generally known state of the prior art, specifically with reference to a higher torque to be transferred. In this regard, the inventor was aware of the practical constraint that he can only make available a gear mechanism with which a whole-number translation between the input and the output can be achieved. Other gear mechanisms would not fall within the general practical standard, and would therefore not find any utility for those skilled in the art.

In order to be able to achieve the requirements of a whole-number translation ratio to be produced, in total, by the three-stage gear mechanism, the inventor investigated what total translation ratio can be achieved at the output of a second gear stage that follows a first gear stage. In this regard, in the case of a three-stage gear mechanism, the aforementioned first stage would be the second stage, and the aforementioned second stage would be the third stage, and therefore the last stage.

Diagram No. 3 shows the total translation ratios that can be achieved in two consecutive stages of a gear mechanism if a translation ratio has already been achieved in the previous stage. The total translation ratio of such a gear mechanism therefore results from a multiplication of the translation ratio of the previous stage and the translation ratio of the following stage. In Diagram No. 3, the translation ratio of the previous stage, with which a transition into the following stage takes place, is plotted on the ordinate, while the translation ratio that can be achieved in the following stage is plotted on the abscissa. In the diagram, all possible translation ratios that can be combined with one another in construction terms are entered for those plotted on the abscissa and the ordinate. In this regard, only a total of nine translation ratios that can be implemented by analysis are obtained. A particularly high whole-

number translation ratio, with a total translation ratio of $i = 4 \times 5.5 = 22$, is demonstrated by a combination of a translation ratio of $i = 4$ in the front stage and $i = 5.5$ in the following stage. With reference to the invention, the "front" gear stage corresponds to the second (next-to-last) stage of the three-stage gear mechanism there, and the "following" gear stage corresponds to the third and therefore last gear stage (power take-off stage of the gear mechanism).

This results in the first essential inventive step in the case of a three-stage gear mechanism, that of selecting the translation ratio in the next-to-last gear stage as 4, and in the last gear stage as 5.5, in order to thereby obtain a relatively higher whole-number translation ratio, in total of 22. The actual, fully surprising advantage that can be achieved with the invention is shown by Diagram No. 4.

In this Diagram No. 4, different translation ratios are plotted on the abscissa, and the torque that can be achieved is plotted on the ordinate, as a percent of a maximum torque (100 )that can maximally be achieved at a specified translation ratio. A maximum torque that can be achieved in a gear stage having an internal geared wheel with 108 teeth and three or four planet gears can be achieved at a translation ratio of $i = 5.5$.

The decrease in the torque that can be achieved at other translation ratios is very clearly illustrated by Diagram No. 4. This recognition of how the highest possible torque can be achieved on the power-take-off side of a two-stage planetary gear mechanism, surprisingly resulted from the inventive discovery by the inventor. This is in contrast to what was previously known in the art of gear mechanisms, because the present invention also included non-whole-number translation ratios in the inventor's analysis and calculations, and structure produced.

Furthermore, the inventor was able to find that in a gear stage having four planet gears, as compared with a gear stage having only three planet gears, a significantly greater maximum (135%) torque can be achieved. The related increase in the torque is shown in Diagram No. 5, by means of a comparison of the ratios for three (100%) and four (135%)planet gears in a gear stage, wherein i=5.5. This increase in load capacity from 100% for three planet gears up to 135% for four planet gears at i=5.5 and with 108 teeth internal gear was totally unexpected and was unpredictable.

As the above explanations clearly and convincingly show, the inventor was able to achieve an unexpectedly, surprisingly beneficial result, in total, with the combination of individual,

specific gear mechanism parameters he selected, namely the number of planet gears and the translation ratios to be selected in the individual gear stages, with internal geared wheels having a tooth number of 108, in each instance. This result is based on inventive activity particularly because the inventor did not choose only whole-number partial translation ratios in the individual stages, as is generally known, because a whole-number translation ratio is to be achieved between the input and output of a three-stage gear mechanism, in total. Instead, the inventor, in a completely different manner, also discovered possible non-even-number translation ratios, and thoroughly investigated the resulting consequences and possibilities.

I further declare that all the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false4 statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may

jeopardize the validity of the application or any patent issuing thereto.

Date: 29.11.04

THOMAS BAYER

Enclosures: Diagrams 1 to 5

DeclarationunderRule132

diagram 1

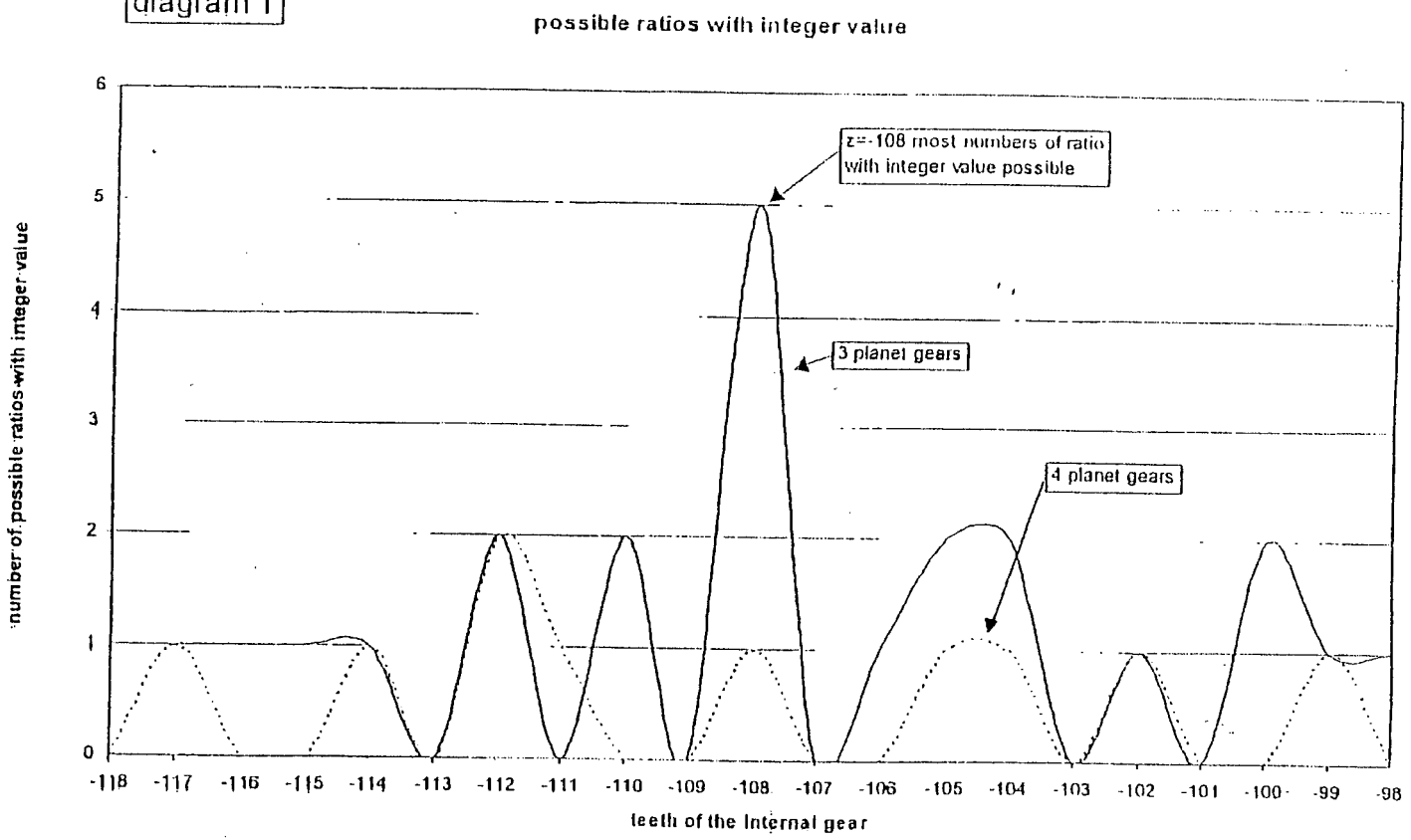

diagram 2

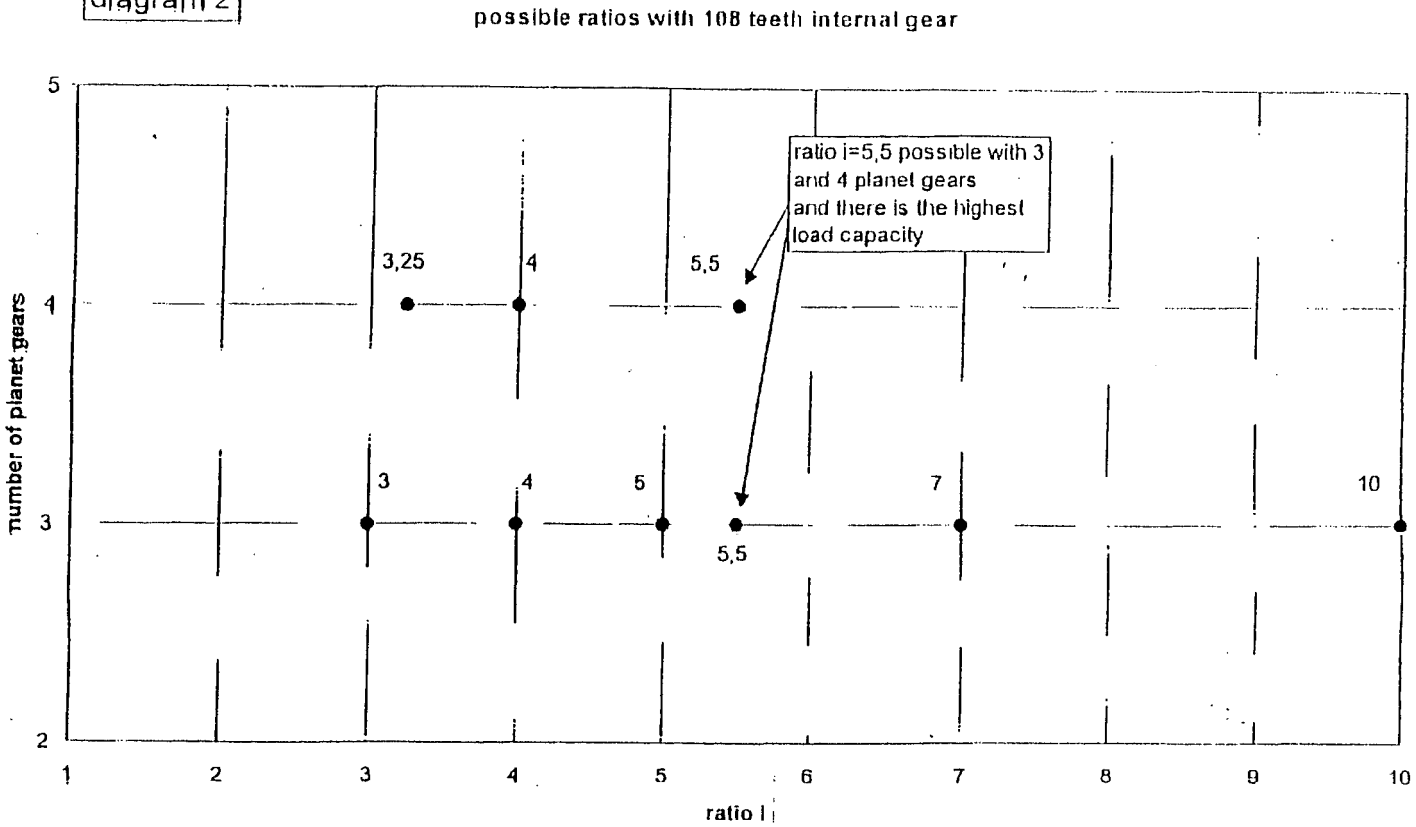
possible ratios with 108 teeth internal gear
ratio i=5,5 possible with 3 and 4 planet gears and there is the highest load capacity
number of planet gears
ratio i
3,25
4
5,5
3
4
5
7
10
5,5
5
4
3
2
1
2
3
4
5
6
7
8
9
10

diagram 3

possible two stage ratios with 4 planet gears

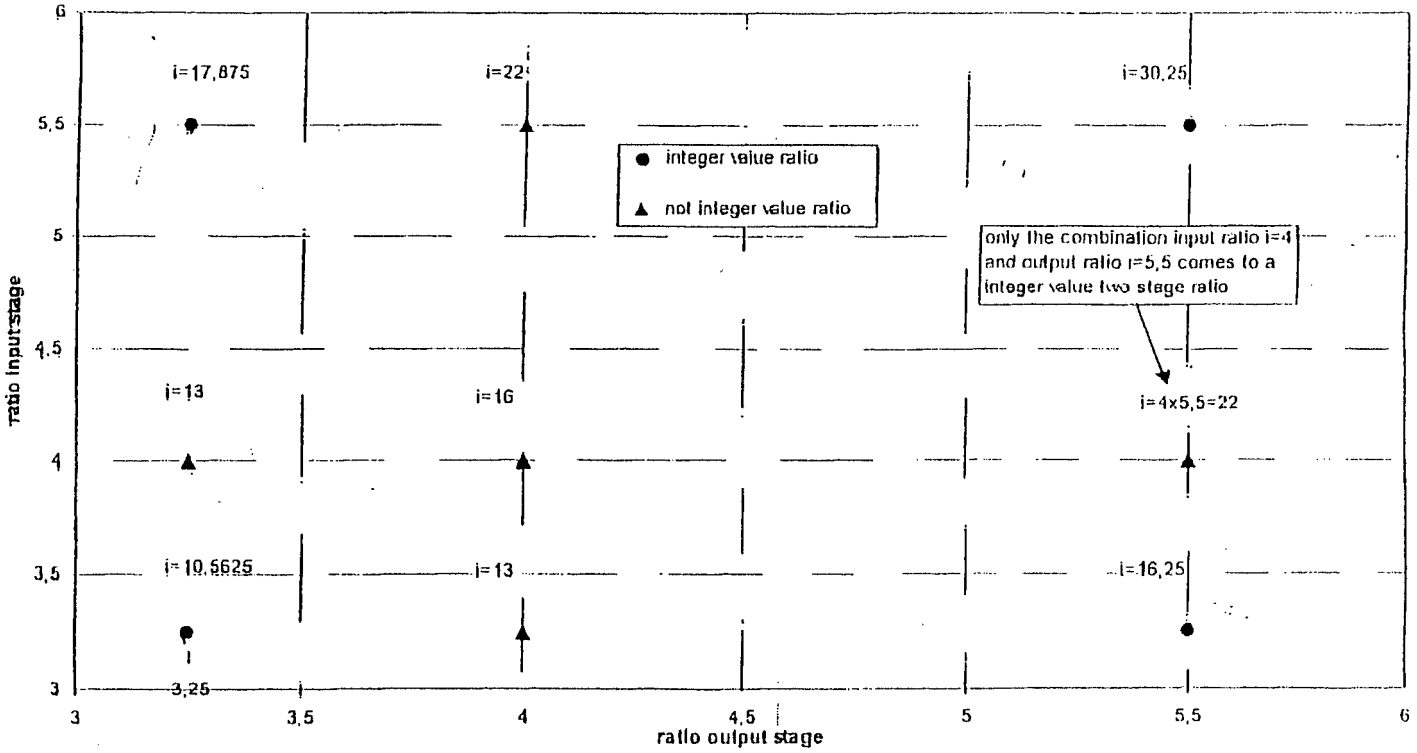

diagram 4

load capacity of different ratios i with 3 planet gears

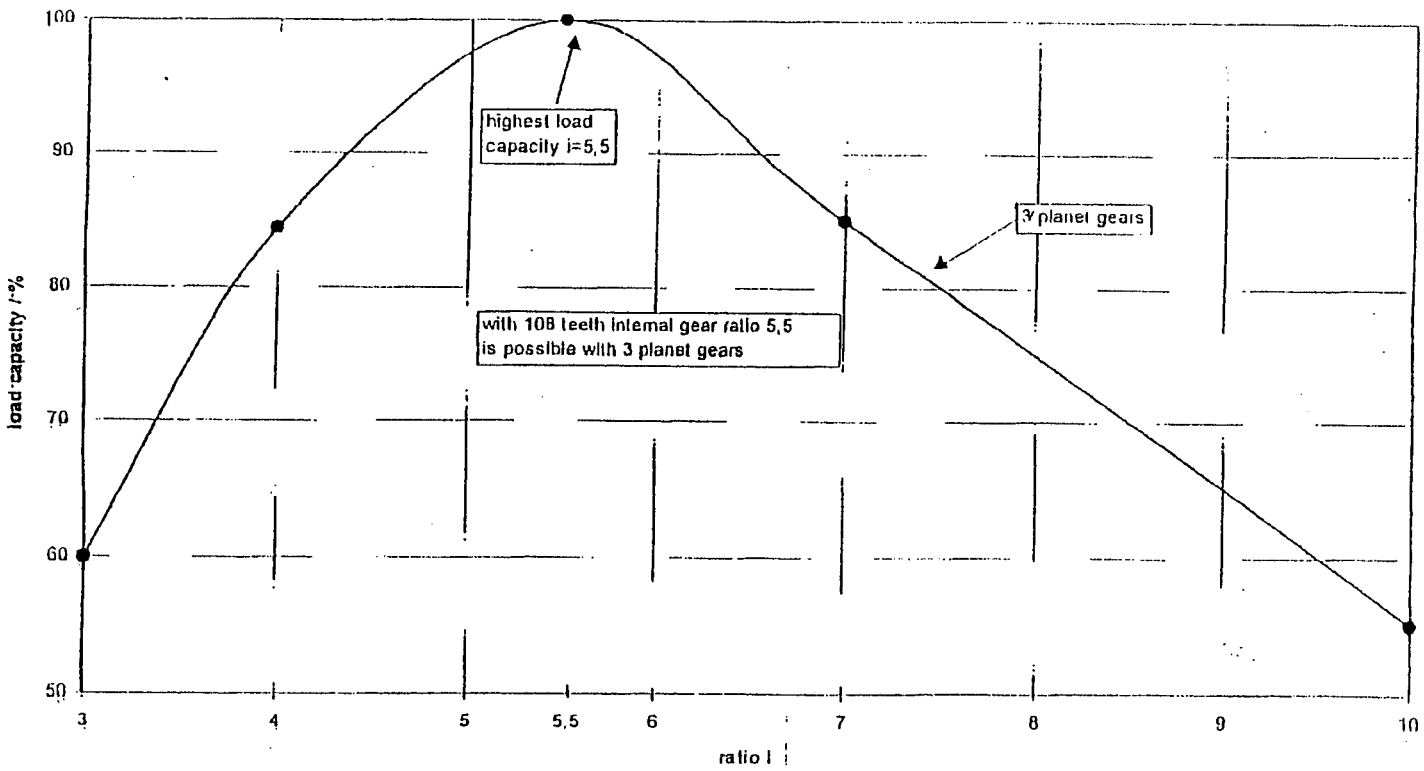

diagram 5

load capacity of different ratios i with 3 and 4 planet gears